Storm Sewer Screening Project
2002 Annual Summary
and Final Project Review

Clark County Public Works
Water Resources Section

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Introduction

Clark County's National Pollutant Discharge Elimination System (NPDES) permit requires dry-weather pollutant screening of stormwater outfalls and storm sewer lines as a basic monitoring (S5.B.4) and illicit discharge elimination tool (S5.B.g). In response to these requirements, Clark County Public Works Water Resources (Water Resources) designed and implemented a storm sewer screening project which began in the year 2000.

After three years of implementation, the original project has achieved some success in detecting and eliminating illicit discharges to Clark County storm sewers. However, the project scope is insufficient to meet future needs for storm sewer screening and the associated coordination of pollutant removal activities. Therefore, 2002 was the final year of project implementation in its current form. The project will be redesigned and refined for 2003.

This report includes a summary of 2002 Storm Sewer Screening Project results and a brief Final Project Review of activities since its inception.

Definition of Illicit Discharge

According to the U.S. Environmental Protection Agency (EPA, 2000), an illicit discharge is any discharge to a municipal separate storm sewer system that is not composed entirely of storm water. These may include inappropriate piped connections of waste lines to the storm sewer system, or a variety of inappropriate activities that result in waste products or wastewater entering storm sewer inlets. However, screening programs are not required to address or attempt to eliminate certain types of non-stormwater discharges, including the following:

Water line flushing
Landscape irrigation
Diverted stream flows
Rising ground waters
Uncontaminated ground water infiltration
Uncontaminated pumped ground water
Footing drains
Lawn watering
Individual residential car washing
Discharges from potable water sources
Foundation drains
Air conditioning condensation
Irrigation water
Springs
Water from crawl space pumps
Flows from riparian or wetland habitats
Dechlorinated swimming pool water
Street wash water

Storm sewer screening is a preliminary tool which will not necessarily identify all illicit pollution sources. Since pollutant discharges to storm sewers are often brief or intermittent, screening will not identify many small, periodic pollutant discharges from illicit connections, spills, dumping, or other activities. However, screening *is* likely to identify storm sewers having substantial or ongoing illicit discharge problems.

2002 Summary

The project objective in 2002 was to re-visit high priority screening sites which exhibited dry weather flow or possible illicit discharges during 2001 monitoring.

A total of 37 sites were screened for illicit discharges in 2002, and 6 referrals were made for technical assistance visits (TAVs) to investigate possible illicit discharges. Additionally, seven sites showed levels of bacteria above state standards.

Characteristics

Sampling characteristics were based primarily on the U.S. EPA 1993 Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems user's guide (EPA, 1993). Table 1 shows the monitored characteristics, analysis methods, resolution or reporting limit, accuracy, and reference numbers for the 2002 Storm Sewer Screening Project.

Characteristic	Method	Resolution/ Reporting Limit	Accuracy	Reference
		conc./units	field instruments	lab
Estimated Flow Rate	Field observation	n/a	n/a	n/a
Odor	Field observation	n/a	n/a	n/a
Color	Field observation	n/a	n/a	n/a
Floatables	Field observation	n/a	n/a	n/a
Deposits/Stains	Field observation	n/a	n/a	n/a
Vegetation	Field observation	n/a	n/a	n/a
Damage to outfall	Field observation	n/a	n/a	n/a
Turbidity	Nephelometric	0.01 NTU	±2% of reading	n/a
Temperature	Thermistor	0.20 NTU	±0.1 C	n/a
Conductivity	Electrode	4 digits	± 1% of reading	n/a
pH	Glass electrode	0.01 units	± 0.2 pH units	n/a
Ammonia	Colorometric	0.05 mg/L	n/a	EPA 350.1
Total Chlorine			n/a	
Copper			n/a	
Zinc			n/a	
E.coli	MPN	1 MPN/100mL	n/a	*SM 9221

*Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Ambient Water; Proposed Rule

Table 1. Screening characteristics, analytical methods and detection or precision limits.

EPA states that the set of physical characteristics will likely be the most useful indicators of illicit discharges (1993). Taken in combination, they can indicate the presence and often the degree of contaminated flows. Chemical characteristics were included to supplement the physical inspection.

Copper, zinc, and bacteria (E. coli or fecal coliform) do not appear on the EPA recommended list. Copper and zinc are used by the City of Portland as basic indicators of metals contamination and were recommended for inclusion in this project (Dirks, 2000).

Bacteria sampling is not generally included in illicit discharge screening protocols, but was included in this project due to the potential for human health impacts to recreational creek users during the summer months. Sites with high bacteria levels are not categorized as "illicit discharges" in this summary. Rather, they are addressed as a separate issue and receive follow-up attention separately from the more traditional suspected "illicit discharges".

Quality Control/Quality Assurance

Laboratory analyses were conducted by North Creek Analytical (NCA), a State of Washington Department of Ecology-certified laboratory located in Beaverton, Oregon. Laboratory QA/QC

procedures were conducted according to NCA's approved QA/QC manual (NCA, 1997). Samples were collected in properly prepared bottles supplied by the laboratory. Bottles were labeled with project name, site number, date, and time, using waterproof pens. Chain of custody documentation was prepared for each sample set and is on file at Water Resources.

Field meters were calibrated per manufacturer's instructions prior to each sampling event. Field data were recorded using waterproof pens and field forms.

Field Methods

Physical observations and water samples for laboratory analysis of E. coli, ammonia, total chlorine, copper, and zinc were collected at all sites having sufficient flow to enable sample collection. A Hydrolab® multi-parameter field instrument was used to measure water temperature, pH, conductivity, and turbidity. Appendix 1 is an example of the field data collection sheet.

Water samples were collected by one of two methods depending on site conditions: 1) direct immersion of sample bottles, or 2) a long-handled sampling dipper. Water depth was often insufficient to enable in-situ use of the Hydrolab® equipment. In these cases, water was collected in a clean bucket or with the long-handled dipper and the Hydrolab® sensors immersed in the container.

Illicit Discharge Follow-up Protocol

Conventional illicit discharge referrals: The storm sewer screening project generally does not perform the follow-up investigations and TAVs required to eliminate illicit connections or discharges. Rather, suspected problems are referred to Stormwater Program TAV staff for further action. Referrals and follow-up visits for 2002 are summarized in the Results and Referrals sections.

Bacteria referrals: Under the current project scope, a satisfactory follow-up mechanism for bacteria referrals has not been developed. In 2002, general follow-up investigations were conducted by Water Resources staff at two sites where high levels of bacteria were detected. A source could not be readily identified through additional field testing and efforts by Hazel Dell Sewer District (HDSD) to locate breaks in nearby sewer lines. These activities were quite limited in scope and highlighted the need for more sophisticated site investigations and well-developed referral protocols when the project is redesigned in 2003.

2002 Results

Staff visited 37 sites during June 2002. Figure 1 and Figure 2 show the location of the 37 screened sites. Stormwater outfalls with sufficient dry-weather flow to enable sampling were found at 19 of the 37 sites. Staff observations and water quality samples indicate that water at most of the sampled sites came from the allowable sources listed in the Illicit Discharges Defined section (e.g. groundwater springs, lawn watering, etc).

Results from the 19 screening sites where water samples were collected are shown in Table 2. Six potential illicit discharges were referred to TAV staff. Referrals were based on field visit information or observations by field staff en route to selected screening points. In addition, 7 of the 19 sampled sites had E.coli levels above 100 cfu/100mL

The state standard for Class A waters is a 30-day geometric mean concentration of 100 cfu/100mL. The screening project protocol consists of collecting a single sample at each site, so a true measurement against the standard is not possible. Therefore, results over 100 cfu/100mL may not indicate a true exceedance of standards, but are assumed to indicate possible bacteria problems.

Site #	Copper (mg/L)	Zinc (mg/L)	NH3-N (mg/L)	Chlorine (mg/L)	E. coli (MPN/100ml)	Temp (C)	Conductivity (uS/cm)	DO (mg/L)	pH (units)
173	0.003	0.012	ND	ND	435	15.0	283	9.5	7.5
181	ND	ND	0.018	ND	114	14.2	269	3.6	6.9
224	ND	0.018	0.027	ND	5	14.5	214	6.8	6.8
225	ND	ND	0.055	ND	179	14.8	47	8.8	7.3
238	ND	ND	ND	ND	1410	13.6	61	10.5	7.4
627	ND	0.025	ND	ND	5	15.9	192	4.8	7.0
637	ND	0.005	ND	ND	50	15.6	272	8.8	7.8
685	ND	ND	0.067	ND	1990	14.9	209	11.0	7.4
703	ND	0.024	ND	ND	ND	13.9	225	9.4	7.4
821	ND	ND	ND	ND	ND	15.6	223	9.8	7.7
837	ND	ND	ND	ND	19	17.7	230	9.0	7.2
838	ND	ND	0.059	ND	ND	16.9	253	6.9	7.2
839	0.005	0.016	ND	0.158	ND	15.0	258	9.8	7.8
872	0.011	0.010	ND	ND	7	26.0	1143	7.2	8.4
875	0.027	1.030	0.922	ND	214				
2000	0.004	0.061	ND	ND	14	16.6	259	9.7	7.6
2012	ND	0.006	0.348	0.170	2420	16.6	266	5.7	6.9
2014						17.0	268	4.1	6.8
2015	ND	ND	ND	0.319	ND	14.9	203	9.0	7.4

Table 2. 2002 Screening Project laboratory and field meter results.

2002 Referrals

Conventional Illicit Discharges

Cary Armstrong, Clark County Waste Reduction Specialist, performed the technical assistance follow-up visits for the 2002 sampling season. Actions taken at each of the six referred sites in 2002 are summarized by Cary as follows:

1) Site 794: Classic Auto Care at 1209 NE 88th Street

Issue: Washing cars near storm drain without BMPs

This site has been a re-occurring problem. This site was first visited by Jim Mansfield a couple years ago in April 2000. The business was called Rick's Automotive. Jim had talked to the owner Rick Bosseau and gave him stormwater BMPs as well as ways to deal with hazardous waste being stored outside and disposal of trash piling up on a flatbed truck on the side. Jim then did a followed up in May 2000 and the trash and all was still there. It finally took a call to Code Enforcement to get the trash hauled away.

A visit was later made to this site on September 10, 2002 responding to Derrick's complaint about them washing cars out front. Classic Auto Care is a new business with a new owner. Talked to

one of the employees since the owner was not present. The new county ordinance and the proper BMP's for this business were explained and even showed him how the guy next door solved the problem, more or less, of keeping the soapy water away from the storm drain. This business will probably require another visit.

2) Hazel Dell Lanes at 6300 NE Highway 99

Issue: Catch basins full of sediment

The site was visited on September 10, 2002. Talked to the manager who referred me to the owner, Denny Labsch. Denny said by phone that the highway project and new bridge at NE 63rd caused $20,000 worth of damage to his driveway, which he paid for. Then after he fixed his parking lot, the state workers used it for a wash station and they are the ones that filled it with sediment. He has sent the state a bill for his new parking lot but has heard nothing. Currently contacting the state to try to work out something where they will pay for the cleaning of the catch basin. It was done by a sub-contractor so it is taking some time.

Denny was informed that if the state or sub-contractor can't get the catch basin cleaned, he still was responsible for having the work done. Sent him a list of companies that do the work but have not given him a deadline. Once the sub-contractor is contacted a timeline will be set for Denny to have the work completed by he or the contractor.

3) Site 875: **Swale near State Pipe Company at 3508 NE 68th Street**

Issue: Strong odor of paint thinner, oily sheen coming into swale

Visited site on October 25, 2002. Found the swale but no water was coming out of any outfall pipes. From what was determined, this particular swale collects all the roof and parking lot runoff from the entire industrial park on the north side of NE 68th Street. Two companies within the industrial complex that could be using the products causing the odor were inspected. The first company was Cabinet Designs Unlimited. They manufacture cabinets and use stains, thinners, paints and other hazardous chemicals. Explained the County Water Quality Ordinance and what was found in the swale. Instructed the employees present of the necessary BMPs. No visible evidence that this business' activity would be flowing towards the swale. However, it was dry, had been dry for awhile and all the work was being done inside. No evidence that anything was being dumped or even used outside.

Visited Intek Exhibit Systems. They also use paints, stains and solvents and again gave them all the necessary information. There were no signs of outside activity that lead to the swale.

This is a large industrial park that will need further investigation.

4) Site 872: BOC Gas at 4715 NE 78th Street

Issue: High Temperature, pH, and conductivity levels.

BOC Gas is now connected to the City of Vancouver sanitary sewer system and are no longer discharging into Clark County's storm water system.

5) Site 2014: Texaco/Vancouver Oil Company at 1503 NE 136th Street

Issue: Oily sheen, strong fuels odor, swale full of oily silt

Visited site on August 15, 2002. Met with the manager Joe Henderson to explain the sampling results and possible sources. The oil/water separator is suspected of leaking into the swale. The next maintenance visit was due in September or October and Joe was going to call when the

service company came out. No call has been received since so a follow-up visit will be scheduled.

6) Site 847: Muchas Gracias Ditch at Hwy 99 and NE 61st Street

Issue: Oily sheen on water surface

Visited site on September 10, 2002. It was a dry day so there was no flowing water nor oil sheen. This site has been of ongoing concern.

Site was revisited on Dec. 30, 2002. It had been raining heavily all day and there was quite a bit of water flowing in the gutters. There was an oily sheen coming from the corner of NE Minnehaha and Highway 99. Other than cars leaking oil as they drive by, no other evidence of source control issues from businesses observed. Two bio-bags were moved out of the stream and that decreased the sheen a little.

Bacteria

Follow-up samples were collected at two of the seven sites where levels of bacteria greater than 100 MPN/100mL were detected (Site #685 and Site #2012). Results of laboratory analyses and discussion of actions taken at each site are included in individual case files for these sites. The development of mechanisms for efficient follow-up and referral was outside the scope of the Screening Project. Follow-up mechanisms will be developed as the project is redesigned during 2003. General follow-up activities initiated at Site #2012 during 2002 will be used to begin designing prototypes of these mechanisms.

Final Project Review

Referral Summary

Summary maps showing field screening locations, high bacteria sites, and referral sites for the 2000-2002 Storm Sewer Screening Project are shown in the Appendix.

Conventional illicit discharges
Over the three years of project implementation, 25 referrals were made for TAV follow-up at a total of 19 sites. Four sites were referred in two different years, and one site was referred in all three years (Table 3). In the second and third year of the project, a high percentage of referrals were for sites which had already been referred in previous years. In 2001 50% of referrals were repeats (3 of 6), while in 2002, 83% (5 of 6) were repeats. Given the fact that the same set of sites were being screened each year, this pattern is not surprising. As problem sites were discovered and addressed, only the more persistent problems continued to recur from year to year. With no new sites being screened, the list of problem sites should continue to get smaller until only unsolvable or very persistent problems remain.

Referrals were generally based on one of three types of information:
1) visual evidence at the site
2) field water quality measurements
3) laboratory water quality testing

Of the 25 referrals for suspected illicit discharges, only two were a direct result of laboratory analysis of water samples. One additional site was referred on three separate occasions based directly on field water quality measurements. The remaining 20 referrals (80%) were based

primarily on visual evidence at a screened site or chance observations by staff en route to screening sites.

Site #	Description	2000	2001	2002
#872	BOC Gas process water entering storm drain	X	X	X
#807	Auto repair shop disposing waste and washwater into storm drain	X	X	
#794	Auto detail shop NE 88th St discharging soapy wash-water to storm drain	X		X
#2014	Texaco station at NE 136th St and NE 16th Ave, oily sludge and dirty water in ditch	X		X
#847	Ditch at Hwy 99 and NE 61st St with dirty water and oily sheen near restaurants and oil change co.		X	X
#685	Ditch at Hwy 99 and NE 20th Ave with ammonia and chlorine	X		
#2015	Pacific Rentals disposing of wash water in storm drain	X		
#804	Manholes with oily, dirty water near corner of Hwy 99 and 99th St	X		
#839	Auto shops in strip mall with oil sheen in catch basin, soapy water discharge to storm drain		X	
#875	Swale near State Pipe Company, odor of paint thinner, oily sheen			X
#204	Cedars Golf Course drain to creek with high ammonia	X		
#10001	Four Season's Auto Center stack of transmissions leaking oil	X		
#10002	Salmon Creek Mini-storage possibly allowing soapy wash-water in storm drain	X		
#10003	Private residence on NE 222nd Ave near 104th St, large graded area no BMPs	X		
#10004	NW Natural utility work, erosion with no BMPs in place	X		
#10005	Miller Estates subdivision with poorly maintained sediment BMPs	X		
#10006	Lawn crew at UPS at St John's and 68th St blowing clippings into gutter		X	
#10007	Horses with unrestricted stream access, NE Baker Creek Rd just north of NE 174th St		X	
#10008	Hazel Dell Lanes catch basins full of sediment			X

Table 3. Screening Project illicit discharge referrals, 2000, 2001, and 2002.

Bacteria

Bacteria samples were assumed to indicate a potential contamination problem if the result exceeded the state Class A fecal coliform standard of 100 cfu/100mL. This convention was followed during all three years, although different bacteria indicator species were used each year.

Over the three years of project implementation, 30 samples from a total of 22 screened sites exhibited bacteria concentrations in excess of 100 MPN/100mL (Table 4). Eight sites had high bacteria levels in more than one year.

Sites with bacteria >100 MPN/100mL	2000 (fecal coliform)	2001 (enterococcus)	2002 (E. coli)
#26	**170**	n/s	n/s
#37	80	**170**	n/s
#173	30	n/s	**435**
#181	80	n/s	**114**
#205	**1600**	**130**	n/s
#225	50	**240**	**179**
#238	**300**	23	**1410**
#263	13	**300**	n/s
#321	**220**	n/s	n/s
#397	**1600**	23	n/s
#627	**900**	23	5
#637	**900**	**1600**	50
#638	**1600**	n/s	n/s
#681	**300**	**900**	n/s
#685	**1600**	27	**1990**
#837	50	**170**	19
#842	**220**	n/s	n/s
#851	**300**	**300**	n/s
#872	30	**110**	7
#875	n/s	n/s	**214**
#2000	6	**1600**	14
#2012	n/s	**2420**	**1600**

n/s = not sampled

Table 4. Screening sites with bacteria >100 MPN/100mL in <u>at least one year</u> between 2000 and 2002.

<u>Source Removal</u>

Conventional illicit discharges

Detailed descriptions of TAVs and source removal activities may be found in the annual project reports.

Of the 25 referrals for suspected illicit discharges, only three resulted in the discovery of direct connections of inappropriate waste lines to the storm sewer. These three referrals all occurred at the same location (Site #872), where an illicit connection was piping contaminated process-water (elevated temperature and conductivity levels) from BOC Gas into the county storm sewer. This site was referred to the State of Washington Department of Ecology (Ecology) in 2000 due to ongoing Superfund cleanup issues at the same location. In response to persistent Ecology and county TAV staff follow-up, BOC Gas agreed to connect the waste line to the sanitary sewer. This work was completed during summer of 2002 and has alleviated the problem.

Illicit discharges stemming from the remaining 22 referrals were the result of poor or nonexistent BMPs or inappropriate waste disposal activities. Removing these sources was dependent on successfully changing behaviors or upgrading BMP practices utilized by the offending business or landowner. Follow-up visits by technical assistance staff focused on educating business owners or managers regarding proper BMPs and waste management techniques, and requesting that a variety of actions be taken to eliminate storm-sewer contamination.

In some cases, where repeated suggestions or warnings by TAV staff were ignored or not implemented effectively, county Code Enforcement staff were notified. Unlike TAV staff, Code Enforcement staff have regulatory authority and may issue citations if site conditions warrant. No citations have been issued in response to Screening Project referrals.

Due to the intermittent nature of inappropriate waste disposal activities, it is difficult to determine the overall success of the Screening Project and TAV visits at removing pollutant sources. TAV staff estimate that 1/3 to 1/2 of behavior changes are short-term. Poor BMP maintenance and improper waste disposal may resume after county follow-up visits cease, necessitating ongoing visits by county staff.

Given these constraints, TAV and project staff estimate that the Screening Project has achieved approximately 50% success in long-term source elimination. Most sites experienced at least a temporary improvement in waste management or BMP practices.

Bacteria

No bacteria sources were removed under the Screening Project. The level of follow-up, specialized equipment, and interagency coordination necessary to successfully address dry-weather bacteria problems in the storm sewer system was beyond the scope of the current project.

Suggestions for Project Redesign

1) Project Scope and Site Selection

The Screening Project was originally designed to re-visit a number of storm sewer outfalls which exhibited dry-weather flow during NPDES monitoring in 1995, then continue systematic screening of additional stormwater outfalls beginning with areas having a high risk of industrial or commercial waste discharge. Out of nearly 1000 storm sewer points visited in 1995, approximately 70 had dry-weather flow at the time of sampling. Twenty-five of those 70 sites had been incorporated into city boundaries by 2000, leaving approximately 45 sites to form the initial sample set for the year 2000. An additional 64 sites were visited on a systematic basis, beginning with areas of older development and high levels of industrial or commercial development, for a total of 109 sites screened during 2000.

By 2001, management priorities had changed and the Screening Project was scaled back from its original scope. Rather than continuing the systematic exploration of storm sewer outfalls as designed in 2000, the 2001 project was limited to re-visiting sites where dry-weather flow or suspected illicit discharges were discovered during 2000. This sharply reduced the number of sites visited, and curtailed the systematic exploration of storm sewers county-wide. During 2001, a total of 49 sites were re-visited and screened for illicit discharges.

The same design was again used during 2002 screening, resulting in screening re-visits to 37 sites where dry weather flow or suspected illicit discharges were found during 2001.

The utility of the original project was diminished by limiting screening site visits to locations where problems were previously encountered or suspected. This method resulted in an ever-shrinking list of screening sites and caused the project to focus on a small subset of the county to the exclusion of other developed and developing areas.

Future site selection and field work should be systematic, ongoing, and cyclical, with contingencies for re-visitation of problem areas on a more frequent basis. Additionally, the Screening Project should be coordinated with other Water Resources monitoring activities.

2) Monitored Characteristics

Ninety-two percent of the referrals for suspected illicit discharges during the three years of project implementation were the result of either visual evidence or measurements with field instruments. The cost for the non-bacteria parameters routinely analyzed in the laboratory (ammonia, total chlorine, copper, and zinc) is approximately $65 per sample.

Given this cost and the limited number of referrals based on laboratory analyses, it is recommended that routine laboratory analyses for ammonia, total chlorine, copper, and zinc be eliminated. A suite of relevant parameters should be identified for use when site conditions or field instruments suggest that further analyses are warranted.

Routine laboratory analysis for bacteria will be necessary to detect problems, and should be continued. Source identification of bacteria problems may be challenging and could require sophisticated techniques. Standard techniques such as dye testing and t.v. inspections of sewer lines were insufficient to locate diffuse sources in their limited application during the current project. Future source identification efforts will need to address possible strategies, such as pressure testing of pipes or other more complex approaches, for use when standard techniques fail.

3) Source Removal

Follow-up by TAV staff has been successful in educating landowners and removing or curtailing many conventional illicit discharge sources. Continued TAV follow-up is recommended for conventional illicit discharge removal in cases where an observed or traceable discharge exists.

Where the source is not easily traceable, effective bacteria source removal is not feasible under the current project design. This is a significant issue to be addressed in redesigning the project. Key elements will be determining an appropriate level of Water Resources monitoring group follow-up, and coordinating effective hand-off and follow-up protocols. A high level of

coordination will be required between the Water Resources monitoring group, Water Resources capital group, Health Department, and sewer operators.

4) Storm Sewer Mapping

Incomplete drainage maps posed a significant challenge to source identification and removal. County-wide storm sewer mapping activities are ongoing, and great improvements have been made to the GIS storm sewer map. Future screening activities will be able to take advantage of these improvements, especially in regards to follow-up visits and source tracking. In areas of incomplete mapping, coordination will be necessary between the monitoring and capital groups to facilitate complete map coverage. In cases where follow-up investigations are necessary, mapping activities may need to be performed in the surrounding area prior to the screening follow- up.

References

U.S. Environmental Protection Agency. January 2000. Storm Water Phase II Final Rule: Illicit Discharge Detection and Elimination Minimum Control Measure. EPA 833-F-00-07, Fact Sheet 2.5.

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Appendix